

REMARKS

Claims 45, 46, 50-52, 54-56, 59, 60, 68-70, 73, 74 and 77 are pending in this application. Claims 49, 57, 71, 72, 75 and 76 have been canceled. Claims 45, 50-52, 68, 70 and 73 have been amended. Amended independent claims 68 and 73 incorporate the limitations of canceled claims 49, 57, 72 and 76. New claim 77 has been added to round out the scope of protection afforded by the claimed invention.

Applicant notes that amended independent claim 68 and newly added claim 77 recite that the doped region has “a doping concentration higher than a doping concentration of said first region.” Amended independent claim 73 also recites that the ion implanted region has “an increased doping concentration in an area of said substrate between said separated active regions.” Applicant points out that the specification of the present application teaches that “[O]nce the trenches 22 have been partially filled with the dielectric 24, a masked ion implant is performed to implant ions in the areas of the substrate 12 directly beneath the trenches 22 as shown in FIG. 4.” (Application at 7, lines 13-16). In this manner, “in the case of a p-type substrate 12 with p-wells, p-type ions such as boron (B) can be implanted in the substrate using a photoresist mask 30.” (Application at 7, lines 16-19). The specification further emphasizes that “in the case of a p-type substrate 12 with n-wells, n-type ions such as phosphorous (P), arsenic (As) or antimony (Sb) can be implanted.” (Application at 7, lines 19-21). Accordingly, Applicant notes that the doped region formed by implanting additional ions in “the areas of the substrate 12 directly beneath the trenches 22” must have a higher doping concentration than the doping concentration of the “p-type substrate 12 with p-wells.”

A marked-up version of the changes made to the claims by the current amendment is attached. The attached page is captioned “Version with markings to show changes made.”

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In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Dated: September 9, 2002

Respectfully submitted,

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45. (Amended) The integrated circuit of claim 68 wherein substantially all [the ions] said additional dopants are displaced from said separated active regions by at least one hundred angstroms.

50. (Amended) The integrated circuit of claim 68 wherein [the implanted ions] said additional dopants establish a field threshold voltage.

51. (Amended) The integrated circuit of claim 68 wherein [the ions] said additional dopants are implanted into the substrate below said first area filled with said first dielectric material to a depth in a range of about 10 to 100 percent the depth of said first area filled with said first dielectric material.

52. (Amended) The integrated circuit of claim 68 wherein [the ions] said additional dopants are implanted into the substrate below said first area filled with said first dielectric material to a depth in a range of about 20 to 80 percent the depth of said first area filled with said first dielectric material.

68. (Amended) An integrated circuit comprising:

a semiconductor substrate including a first region of a predefined conductivity type;

a plurality of active regions provided within said first region;

a field isolation region separating at least two of said active regions, wherein said field isolation region includes an isolation trench, said isolation trench further including a first area filled with a first dielectric material forming at least sidewalls of said isolation trench, and a second area filled with a second dielectric material situated within said sidewalls, wherein said first dielectric material and said second dielectric material are different; and

[an ion implanted region of said semiconductor substrate] a doped region within said first region below said second area, [substantially all ions from said ion implanted region being displaced away from said separated active regions] said doped region being of said predefined conductivity type and having a doping concentration higher than a doping concentration of said first region, wherein additional dopants in said doped region causing said higher doping concentration are displaced away from said separated active regions.

70. (Amended) The integrated circuit of claim 68 wherein said [ions] additional dopants from said [ion implanted] doped region are displaced away from said separated active regions by a distance at least equal to a sidewall thickness of said first area.

73. (Amended) A memory device comprising:

a semiconductor substrate including a plurality of doped active regions; [and]

a field isolation region separating [adjacent] at least two of said active regions, said field isolation region including an isolation trench, said isolation trench further including a first area filled with a first dielectric material forming at least sidewalls of said isolation trench, and a second area filled with a second dielectric material situated within said sidewalls, said first dielectric material being different than said second dielectric material; and

an ion implanted region [of said semiconductor substrate] provided below said second area having an increased doping concentration in an area of said substrate between

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said separated active regions, wherein [,] substantially all ions from said ion implanted region [being] which increase said doping concentration are displaced away from said active regions by a distance at least equal to a sidewall thickness of said first area filled with said first dielectric material.